

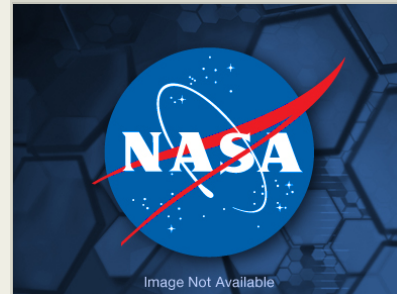
## Advanced Pheno-climatic Information System

Completed Technology Project (2017 - 2019)



## Project Introduction

The ROSES A.41 solicitation highlights the need within the Earth science community to develop a "more complete and more accurate understanding of the temporal and spatial behavior of plant and animals species." It specifically calls for the analysis of "time series measurements of key environmental parameters with the spatiotemporal distribution of organismal populations, communities, and species for improved understanding of the impact of climate change." Phenological observations (the study of cyclic and seasonal natural phenomena, especially in relation to climate and plant and animal life) are highly relevant to these needs. There are extensive existing efforts to collect phenologically-relevant information, including a range of data from in situ, to near-surface cameras and flux towers, to airborne data, to polar orbiting and geostationary satellites. There are also significant efforts to provide gridded historical and projected climate data. However, there is no consolidated effort to compile spatially-associated pheno-climatic information into a data framework that would improve information comparison and reuse, facilitate collaboration within the research community, and increase the speed of production and publication of results related to the needs identified in the solicitation. Here, our objective is to develop an Advanced Pheno-climatic Information System (APIS). The system will incorporate tools, workflows, and software for bringing phenological and climate data together. APIS will be designed to leverage existing expertise, techniques, and networks as much as possible. The primary benefit of this effort is that it will focus on providing pheno-climatic data in way that would allow the scientific community to test families of hypotheses generated from the seed hypothesis that climate change is influencing the spatial distribution and temporal behavior of key populations of organisms, communities, and species. Founded in this seed hypothesis, our proposed methodology is to build APIS with an iterative and agile programming approach and in parallel to a series of increasingly more complex use cases. These three use cases will both provide insights into constructing the information system as well as demonstrate its utility. We start with a fairly straightforward use case connecting observations at point locations to gridded phenology data. We then develop a more involved use case exploring the validation of satellite-based phenology products. Finally, we explore a more complex use case pertaining to the phenology of wildland corridors. The proposed system will enter at Technology Readiness Level (TRL) 2. The technology concept (i.e., a data-centric, distributed SOA) and its' practical application (i.e., analytic workflows to test phenology hypotheses) have been formulated. While multiple service provider APIs have been identified as important, maturity levels vary and the interoperability and integration of these services into scientific workflows have not yet been demonstrated. We will mature the proposed system to exit at TRL3. Use cases will drive system functionality, leading to end-to-end proof-of-concept demonstration. The proof-of-concept will be used to validate critical properties of the loosely-coupled system. The period of performance is July 16, 2017 to July 15, 2019.



Advanced Pheno-climatic Information System

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## Organizational Responsibility

**Responsible Mission Directorate:**

Science Mission Directorate (SMD)

**Lead Organization:**

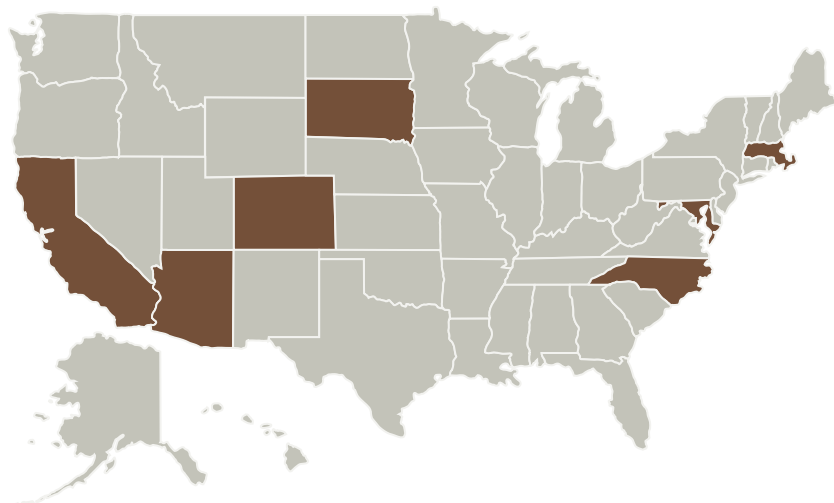
United States Geological Survey (USGS)

**Responsible Program:**

Advanced Information Systems Technology



## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
United States Geological Survey(USGS)	Lead Organization	US Government	Menlo Park, California

Primary U.S. Work Locations	
Arizona	California
Colorado	Maryland
Massachusetts	North Carolina
South Dakota	

## Project Management

### Program Director:

Pamela S Millar

### Program Manager:

Jacqueline J Le Moigne

### Principal Investigator:

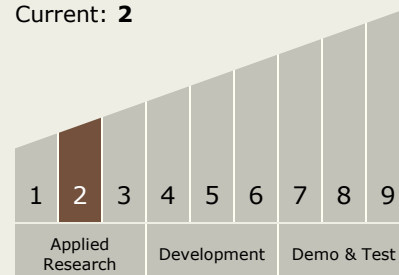
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### Co-Investigators:

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## Technology Maturity (TRL)

Start: 2  
 Current: 2





## Technology Areas

### Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
  - └ TX11.4 Information Processing
    - └ TX11.4.1 Science, Engineering, and Mission Data Lifecycle

## Target Destination

Earth